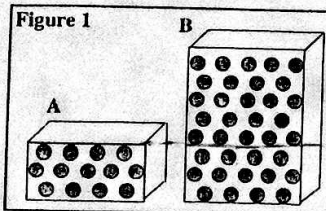


1. Study the matter shown in Figure 1. Each dot represents a particle of matter. [Assume the particles are uniformly distributed throughout each object, and particles of the same size have the same mass.]

a. In the table below, show how the masses, volumes, and densities of A and B compare by adding the symbol <, >, or = to the statement in the second column.

b. Explain your reasoning for each answer in the last column.



Property	Relationship	Reasoning
Mass	$A < B$	B IS MADE UP OF MORE MATTER

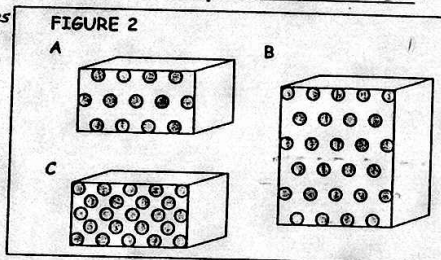
Volume  $A < B$  B HAS A GREATER HEIGHT ( $V = l \times w \times h$ )

Density  $A = B$  THE AMOUNT OF MATTER IN A GIVEN SPACE IS THE SAME

2. Study the matter in Figure 2. [Assume the particles are uniformly distributed throughout each object, and particles of the same size have the same mass.]

a. In the table below show how the masses, volumes, and densities compare by adding the symbol <, >, or = to the statement in the second column.

b. Explain your reasoning for each answer in the last column.



Property	Relationship	Reasoning
Mass	$A < B$	MORE MATTER IS PACKED IN A LARGER SPACE
	$A < C$	MORE MATTER IS PACKED IN THE SAME AMT OF SPACE

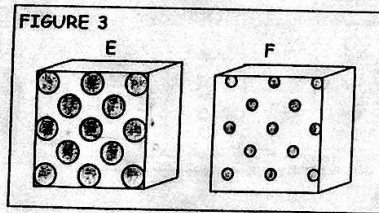
Volume  $A < B$  B HAS A GREATER HEIGHT

$A = C$  SAME  $l \times w \times h$

Density  $A = B$  THE AMOUNT OF MATTER IN A GIVEN SPACE IS THE SAME

$A < C$  THE AMOUNT OF MATTER IS GREATER IN A GIVEN SPACE FOR C

4. Is object E or object F more dense? [Assume the particles are uniformly distributed throughout each object, and particles with a larger size have a larger mass.] Explain your reasoning.



E IS MORE DENSE BECAUSE THE CUBE HAS MORE MASS IN THE SAME AMOUNT OF SPACE

## Density Worksheet

Name KEY

1. Define mass?

THE AMOUNT OF MATTER IN AN OBJECT

2. Define volume?

THE AMOUNT OF SPACE A SUBSTANCE TAKES UP

3. Define density and show the formula for calculating density.

THE AMOUNT OF MATTER IN A GIVEN SPACE

$$d = m/v$$

4. Why does changing the shape of an object have no effect on the density of that object?

CHANGING THE SHAPE DOES NOT CHANGE AN OBJECTS MASS OR VOLUME

5. Aluminum is used to make airplanes. Cast iron is used to make weightlifting equipment. Explain why the densities of these metals make them useful for these purposes?

ALUMINUM HAS A LOW DENSITY WHICH ALLOWS LARGE PLANES FILLED WITH AIR TO FLY. CAST IRON HAS A HIGH DENSITY ALLOWING HEAVY WEIGHTS TO

6. What is the density of water? Remember for water  $1g = 1ml = 1cm^3$

$$1g/1ml$$

BESMALL IN SIZE

7. Why does an air bubble rise to the surface of a glass of water?

THE AIR BUBBLE IS LESS DENSE THAN THE WATER

8. Calculate the densities of the following objects. Remember to place units after each number.

Object A length = 6cm width = 3cm height = 1cm mass = 36g

$$\text{volume} = 6 \times 3 \times 1 = 18cm^3 \quad \text{density} = \frac{36g}{18cm^3} = 2 \frac{g}{cm^3}$$

Object B length = 10cm width = 5cm height = 2cm mass = 300g

$$\text{volume} = 10 \times 5 \times 2 = 100cm^3 \quad \text{density} = \frac{300g}{100cm^3} = 3 \frac{g}{cm^3}$$

Object C Use the water displacement method to determine the density of object C (silly putty).  
initial water level in graduated cylinder = 25ml  
final water level after placing silly putty into graduated cylinder = 29ml  
mass of silly putty = 8g

$$V = 29ml - 25ml = 4ml$$

$$d = \frac{m}{V} = \frac{8g}{4ml} = 2 \frac{g}{ml}$$



OBJECT  
C CONT'D

volume = 4 mL

density = 2 g/mL

9. Which of the following materials will float on water (density 1 g/ml)?

air = .001 g/cm<sup>3</sup> ✓

corn oil = .93 g/cm<sup>3</sup> ✓

glycerine = 1.26 g/cm<sup>3</sup> ✓

corn syrup = 1.38 g/cm<sup>3</sup> ✓

wood = .85 g/cm<sup>3</sup> ✓

steel = 7.81 g/cm<sup>3</sup> ✓

rubber = 1.34 g/cm<sup>3</sup> ✓

ice = .92 g/cm<sup>3</sup> ✓

water = 1.00 g/cm<sup>3</sup> ✓

10. Assuming the materials don't mix, show how the materials would "stack up" in a graduated cylinder.

